REMARKS

The rejections under 35 U.S.C. § 102(b) of Claims 1-6 and 10 as anticipated by JP 07-043524 (Hironobu et al); and under 35 U.S.C. § 103(a) of Claims 7 and 9 over Hironobu et al in view of U.S. 6,074,732 (Garnier et al), and of Claims 7-9 over Hironobu et al in view of U.S. 5,723,075 (Hayasaka et al), are respectfully traversed.

The present invention relates to a laminate having titanium oxide layers and its production method.

As described in the specification under "Background Art," beginning at page 1, line 6, laminates having metal layers laminated on a transparent substrate such as glass have been widely used for window glass in buildings and automobiles, for example, for purposes of suppressing emission of heat rays and as a shielding material to suppress leakage of electromagnetic waves radiating from an apparatus such as a plasma display. At the same time, a high visible light transmittance and a low visible light reflectance is required, as well as a preferred reflection color tone. For this purpose, it is well known to use a laminate having a layer construction wherein dielectric material layers and metal layers are alternately laminated one on another. A low heat ray emissivity alone can be obtained by making the metal layer thick, but this may cause a decrease in the visible light transmittance and increase in the visible light reflectance, and the wavelength range in which a low reflectance can be obtained in the visible light region tends to be narrow, whereby a preferred reflection color tone may be impaired. The above unfavorable phenomenon that the reflection color tone is impaired can be somewhat diminished by using a high refractive index material such as titanium oxide as the dielectric material layer, or by increasing the number of laminations. However, when using such a laminate with titanium oxide layers, visible light transmittance

tends to decrease, and further, the rate of decrease in the visible light transmittance tends to increase together with the increase in the number of laminations. The present invention addresses these problems.

As recited in Claim 1 as amended above, the present invention is a laminate which comprises a substrate, and a titanium oxide layer, a metal layer and a titanium oxide layer laminated alternately in this order on the substrate in (2n +1) layers (wherein n is a positive integer), wherein an interlayer having a refractive index of less than 2.4 at a wavelength of 550 nm is interposed at at least one interlaminar boundary between the titanium oxide layer and the metal layer, wherein each interlayer independently has a thickness of 0.1 to 30 nm, and the total thickness of all interlayers when more than one is present is 40 nm or less.

In another embodiment, as recited in Claim 11, the present invention is also a laminate which comprises a substrate, and a titanium oxide layer, a metal layer and a titanium oxide layer laminated alternately in this order on the substrate in (2n +1) layers (wherein n is a positive integer), wherein an interlayer having a refractive index of less than 2.4 at a wavelength of 550 nm is interposed at at least two interlaminar boundaries between the titanium oxide layer and the metal layer.

Hironobu et al disclose a UV heat ray shielding window comprising a transparent substrate 1, containing the following layers in order: a first transparent dielectric film 2, a second transparent dielectric film 3 different from the first transparent dielectric film 2, a metal or metal nitride film 4, and a third transparent dielectric film 5. Hironobu et al's window is intended to simultaneously shield IR heat rays and UV rays. Hironobu et al's window is stated to have 70% visible ray transmittance and sufficient visibility required as a windshield for automobiles, 57% sunshine transmittance and sufficiently shuts off heat rays

of solar light, performance to shield UV rays is equal to or greater than 10% transmittance of 380 nm wavelength and sufficiently shuts off the harmful UV rays.

As the first transparent dielectric film, Hironobu et al discloses oxides of cerium, titanium, zinc, or chromium. As the second transparent dielectric film, Hironobu et al discloses oxides of silicon, titanium, aluminum, tin, zirconium, tantalum, chromium, stainless steel, and Nichrome. As the metal or metal nitride film, Hironobu discloses platinum, gold, silver, copper, titanium, chromium, aluminum, Nichrome, stainless steel, zirconium, hafnium, and tantalum, as well as the nitrides thereof. As the third transparent dielectric film, Hironobu et al disclose oxides of silicon, titanium, aluminum, tin, zirconium, tantalum, chromium, stainless steel, and Nichrome.

Hironobu et al disclose zinc oxide as the preferred first transparent dielectric film and, indeed, each of the five examples employs zinc oxide as this film as the first layer. In addition, none of the examples contain a metal layer and thus, none of the examples contain a metal layer and a titanium oxide layer laminated alternately. Nor is there any requirement in Hironobu et al that an interlayer between a titanium oxide layer and a metal layer have a refractive index of less than 2.4 at a wavelength of 550 nm.

Hironobu et al do not anticipate the presently-claimed invention. As stated in *In re Arkley*, 172 USPQ 524, 526 (CCPA 1972) (**copy enclosed**):

> [R]ejections under 35 U.S.C. 102 are proper only when the claimed subject matter is identically disclosed or described in "the prior art." Thus, for the instant rejection under 35 U.S.C. [102(b)] to have been proper, the . . . reference must clearly and unequivocally disclose the claimed [subject matter] or direct those skilled in the art to the [subject matter] without any need for picking, choosing, and combining various

disclosures not directly related to each other by the teachings of the cited reference. Such picking and choosing may be entirely proper in the making of a 103, obviousness rejection, where the applicant must be afforded an opportunity to rebut with objective evidence any inference of obviousness which may arise from the similarity of the subject matter which he claims to the prior art, but it has no place in the making of a 102, anticipation rejection.

It is clear that much picking and choosing from the broad disclosure in Hironobu et al to obtain a laminate meeting the terms of the present claims would be necessary, and the likelihood of this occurring is close to zero. Indeed, it would be pure happenstance to arrive at a laminate comprising a substrate and a titanium oxide layer thereon, and a metal layer and a titanium oxide layer laminated alternately in this order thereon, wherein an interlayer having a refractive index of less than 2.4 at a wavelength of 550 nm is interposed at at least one interlamellar boundary between the titanium oxide layer and the metal layer. Thus, not only does Hironobu et al not anticipate the claims, it does not even make a *prima facie* case of obviousness. Compare *In re Jones*, 21 USPQ2d 1941 (Fed. Cir. 1992) **(copy enclosed)** and *In re Baird*, 29 USPQ2d 1550 (Fed. Cir. 1994) **(copy enclosed)**.

It appears that the Examiner is relying on the second transparent dielectric film 3 of Hironobu et al, since it is next to the metal film, when metal rather than metal nitride is used, as analogous to the interlayer herein. While Applicants submit that there is no analogy between the presently-recited interlayer, and film 3 of Hironobu et al, nevertheless, the thickness of film 3 in the examples of Hironobu et al is greater than the maximum thickness for the interlayer recited in amended Claim 1. Although not clear from the disclosure of

Hironobu et al, it seems that film 3 is interposed to satisfy optical characteristics as illustrated in the **attached graph**.

In the graph, values of Tv/Te were obtained as a function of thickness of SiO_2 as film 3 for a glass having the specific film composition and thickness according to Example 1 of Hironobu et al. Tv represents a visible ray transmittance and Te represents a solar energy transmittance. Therefore, in order to maximize visible ray transmittance and minimize heating above room temperature of a motor car, Tv/Te is required to be high. The thickness of the SiO_2 layer in Hironobu et al for maximum Tv/Te is shown in the graph.

On the contrary, the present invention seeks to maximize visible ray transmittance. For this, the interface between the titanium oxide layer and the metal layer has significance. As described in the paragraph in the specification bridging pages 8 and 9:

> In a constitution wherein titanium oxide layers and metal layers are alternately laminated, when the number of lamination is increased, the wavelength width in which a low reflectance can be obtained in the visible light region will increase. However, it was confirmed that the tendency of decrease in transmittance becomes significant along with increase in the number of lamination, more than expected from optical interference effect. The present inventors have conducted extensive studies on this phenomenon and as a result, found that the decrease in transmittance occurs at the interface between the titanium oxide layer and the metal layer. This phenomenon is estimated to be light absorption due to surface plasmon excited by light irradiation in the inside of the metal layer, particularly in the vicinity of the interface with the titanium oxide layer, and it is considered that formation of the surface plasmon can be suppressed to reduce the decrease in transmittance by interposing a layer having a refractive index lower than that of the titanium oxide as an interlayer.

Accordingly, it is unnecessary to increase the thickness of the interlayer to be more than required based on cost considerations. Further, by setting the thickness of the interlayer as described above, the reflectance can be lowered, whereby a wavelength range for obtaining low reflectance can be widened.

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In Hironobu et al, such effects are not disclosed and the goal of obtaining a high visible ray transmittance by focusing on an interface between a titanium oxide layer and a metal layer are not recognized therein.

In addition, Examples 1-131 and Comparative Examples 1-16 in the specification support the patentability of the presently-claimed invention.

Neither Garnier et al nor Hayasaka et al remedy the above-discussed efficiencies of Hironobu et al, since neither disclose or suggest a laminate having the structure of Claim 1.

For all of the above reasons, it is respectfully requested that the rejections over prior art be withdrawn.

The rejection of Claim 8 under 35 U.S.C. § 112, first paragraph, is respectfully traversed. As confirmed by Hayasaka et al, *supra*, near-infrared absorbents are well-known in the art. With regard to SIR 159 described herein, its precise composition is unknown, although it is a dithionine Ni complex type near-infrared absorber. Other commercially available near-infrared ray absorbers similar thereto are IRG 022, which is an iminium type near-infrared absorber manufactured by Nippon Kayaku Co., Ltd., and IRG 002, which is an aminium type near-infrared absorber, manufactured by the same company. It is respectfully submitted that one skilled in the art would be able to make and use near-infrared absorbers commensurate in scope with the present claim. Accordingly, it is respectfully requested that this rejection be withdrawn.

The objection to the oath or declaration is respectfully traversed. The Examiner finds that the title on the oath (Declaration) does not match the title of the application. In reply, the declaration refers to the title as "LAMINATE AND ITS PRODUCTION METHOD." The title of the invention, as described at page 1, line 2 of the specification, is identical.

Accordingly, it is respectfully requested that this objection be withdrawn.

All of the presently pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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IN THE CLAIMS

1. (Amended) A laminate which comprises a substrate, and a titanium oxide layer, a metal layer and a titanium oxide layer laminated alternately in this order on the substrate in (2n +1) layers (wherein n is a positive integer), wherein an interlayer having a refractive index of less than 2.4 at a wavelength of 550 nm is interposed at at least one interlaminar boundary between the titanium oxide layer and the metal layer, wherein each interlayer independently has a thickness of 0.1 to 30 nm, and the total thickness of all interlayers when more than one is present is 40 nm or less.

11. (New)